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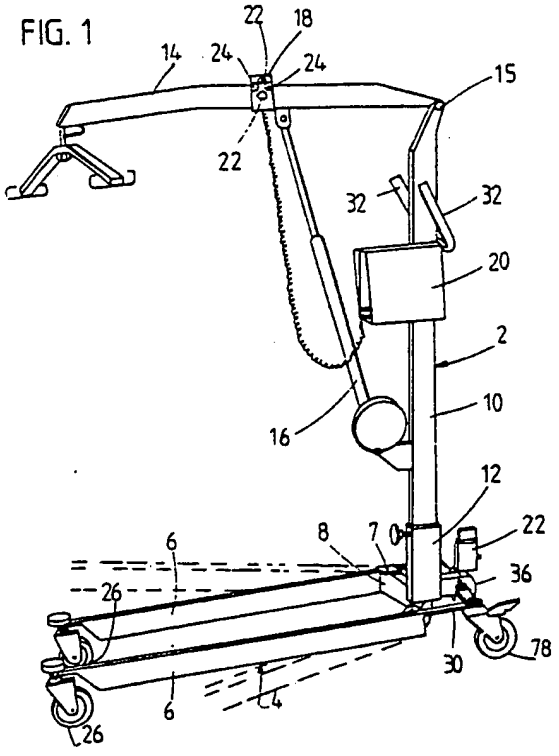
(54) A mobile crane for handling patients.

(57) A mobile crane for lifting and transportion of immobile patients consists of a driving chassis having a crane post topwise provided with a vertically pivotal crane boom projecting forwardly over the driving chassis and supported by a raising and lowering mechanism. The wheel supported driving chassis has a transverse base member, which carries the crane post and is connected with forwardly protruding floor supported beams, which are adjustable in the horizontal plane between a "narrow" position, in which the crane may be moved through a door opening, and a "broad" position, in which the crane is more safely supported on the floor. It has been normal practice that the floor beams are movable between the two positions by means of a manually powered shifting mechanism, which, however, involves certain serious problems with respect to a safe handling of the patient. According to the invention the shifting of the floor beams between the said positions is effected by a motor driven mechanism, which is actuated from a hand carried control box, whereby the operator may attend to the patient with both hands also during the actuation of the shifting mechanism.

FIG. 1



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A mobile crane for handling patients.

The present invention relates to a mobile crane for lifting immobile patients and moving them in a longitudinal direction of the crane, the crane comprising a wheel supported driving chassis having a base portion oriented generally crosswise of said longitudinal direction and carrying an upstanding crane post and a pair of mutually spaced, generally forwardly projecting, wheel supported floor engaging beams, which are connected with adjustment means for generally varying the transverse distance between the beams, while the crane post is connected, topwise, with a crane arm projecting forwardly over the area as effectively supported by the floor engaging beams and connected with means for hoisting a patient to and from a position hanging in the crane.

Cranes of this type are used for local transportation of entirely immobile patients e.g between a bed and an examinaton locality, and it is of course of utmost importance that the person hanging in the crane is extremely safely supported during the transportation. This implies that the driving chassis shall show a considerable length and width. As far as the length is concerned there are no special problems, but with respect to the width the limitation will occur that the crane shall have to be moved through usually narrow door openings, whereby the driving chassis shall have to be or become correspondingly narrow. The associated narrowness is so pronounced that it will not provide for any safe support of the patient during the movements occurring during the transportation and by the handling of the patient at the end stations of the transportation, and it is, therefore, an already established standard that the floor engaging beams are connected with an actuation handle, by means of which they can be caused to be mutually moved in the horizontal plane between a narrow position, in which they are located relatively close to each other, normally parallel with each other so as to be able to pass through a narrow door opening, and a widespread position, normally forwardly diverging from each other from respective pivotal connections with fixed outer ends of the said transverse base portion, in which position the crane and therewith the patient is supported with increased safety.

The actuation handle is normally constituted by a long lever, which projects upwardly along the crane post and is topwise provided with a handle grip, which is seizable for pivoting the handle lever about a lower longitudinal axis, the lower end of the lever being connected with a mechanism for spreading and narrowing the floor support beams. This mechanism may comprise an eccentric cam disc, which is rotated by the pivoting of the actuation handle and is operatively connected with a lever or link system for displacing the floor support beams between the narrow and the widespread position thereof.

Due to the required narrowing of the drive chassis, e.g. by the passage through door openings, it is required in practice that the crane is handled by a particularly competent operator in order to make sure that a patient hanging in the crane will not be scared by the decreased safety as connected with the required narrowing of the drive chassis, e.g. by the passage of a door opening. Normally the patient will be very sensitive to any sign of the operator becoming extra alert, should a situation of danger occur. The said handle should be pushed or pulled in the transverse direction of the crane with a considerable force, not least in case of a heavy patient moved over an uneven floor, and the operator will have to support the crane post in the opposite direction for avoiding a lateral displacement of the entire crane, and preferably at the same time even support the patient against oscillation. Moreover, the operator shall not only move the handle to a new position, but cause it to be arrested in the new position, normally by engaging it into a holding notch in a guide rail mounted along the movement path of the handle; such a locking is desirable for preventing the floor beams from changing their mutual positions by themselves, e.g. if one of them abuts a fixed structure. Critical situations may arise, in which the operator with one hand on the handle just behind the crane post may be unable to intervene with the required firmness and speed if some uncontrolled movement of the crane and/or swinging of the patient is started. Out of deference to the patient the operator should react long before a real danger is encountered.

It is the purpose of the invention to provide a crane of the discussed type, which can be operated with highly increased safety.

According to the invention the adjustment means for varying the distance between the floor engaging beams comprise a motor driven, self-locking mechanism, which is controllable from an easily operable actuator unit in the immediate proximity of the suspension area of the crane, e.g. a hand carried press button control unit as additionally provided with actuator means for the operation of the hoisting means. Hereby the adjustment movements of the floor beams may be effected without subjecting the crane as a whole to any lateral forces, i.e. no compensation pressure should be applied, and due to the self-locking character of the moving mechanism the operator may let go of

the actuator, e.g. a press button, at any time without any risk of decreased stability of the crane. The actuator can be operated with one hand in a position very close to the patient, and with the use of a hand carried control unit the operator may even support the patient with the same hand while the actuation is going on.

The motor driven mechanism will require a power source, the type of which is principally irrelevant to the invention. It is well known, however, that the hoisting means may be driven from an electrical accumulator mounted on the crane, and such a power source will be very suitable also for the present purpose, e.g. for driving an electric gear motor. It is also known that the hoisting means may be actuated via press buttons on a small hand carried control box, whereby the operator may support and guide the patient with both hands during the raising and lowering of the patient, and such a control box may conveniently be provided with additional control buttons for the floor beam moving mechanism according to this invention.

In connection with a servo controlled operation of the floor beams it may be a problem that these beams may incidentally be moved against more or less fixed objects, e.g. underneath a bed, whereby the driving mechanism may be damaged or the beams cause damage. For counteracting such damages an electric drive motor may be connected with an excess current relay, which will stop the motor at a given overload and trigger and associated control unit to the effect that the motor cannot be restarted in the same direction, but only in the opposite direction, whereby the occurred jamming will be relieved. Thereafter, of course, the motor should be startable again in the original direction.

In the following the invention is described in more detail with reference to the drawing, in which:-

Fig. 1 is a perspective view of a crane according to the invention,

Fig. 2 is a top view of the rear part of the driving chassis of the crane, and

Fig. 3 is a schematic top view of a modified driving chassis.

The patient crane shown in Figs. 1 and 2 is designated 2 and comprises a driving chassis 4 having floor supported beams 6, which, at the rear, are pivotally connected, through hinges 7, with mutually opposed ends of a transverse base member 8, which carries a central crane post 10 in a dismountable manner by having a socket member 12 for receiving the lower end of the post 10 and a clamp screw 13 for fixing the post to the socket. At its top end the crane post 10 is connected through a hinge 15 with a crane boom 14, which projects forwardly midways over the area between the floor beams 6 and has a hanger 17 at its free end for use when a patient in some suitable carrier equipment is to be suspended in the crane. Between the boom 14 and the post 10 is arranged, in known manner, a telescopic actuator member 16 driven by an electric motor for controlling the vertical pivoting of the boom about the hinge 15. The motor is controlled from a hand carried control box 18, which is wire connected with a control unit mounted inside a box 20 on the post 10, this box also holding an accumulator for driving the motor.

The control box 18 houses a magnet enabling the box to be temporarily held on the boom 14 or on any other iron part, but in use the operator will hold the box in one hand, which will then be usable both for supporting the patient and for actuating switch buttons on the box.

The control box 18 is in a conventional manner provided with a pair of press buttons 22 for the up/down controlling of the boom 14, but here the box is additionally provided with a pair of press buttons 24 for the controlling of a motor driven mechanism for pivoting the floor beams 6 about their hinge connections 7 with the transverse base member 8.

The crane is supported on swivel wheels 26,28 mounted adjacent the front ends of the floor beams 6 and adjacent the rear end of rear extensions 30 of these beams, respectively. On the crane post 10 is arranged a pair of fixed handles 32 for use by the manual transport of the crane.

The said mechanism for pivoting the floor beams 6 comprises a gear motor 34, which is mounted at the rear side of the base member 8, behind the socket 12, and is connected with a gear housing 36 for rotating a transverse shaft 38. Through cardan joints 40 this shaft 38 is connected with opposed screw spindles 42 received in nut portions 44 on respective connector link arms 46 projecting outwardly to a hinge joint 48 with the rear end of the respective floor beam extensions 30.

When the motor 34 is actuated in one or the other direction it will thus work out that the rear ends of the beam extensions 30 are forced towards or away from each other, whereby the floor beams will pivot about the hinges 7 between a narrow position, wherein they are located practically parallel with each other, and a broad position, wherein they are swung out from each other as indicated in dotted lines, such that the transverse distance between their front ends will be substantially increased, whereby, the crane as a whole is broader and thus more safely supported.

In Fig. 2 it is shown that in connection with the base member 8 end stop sensors 50 may be provided for limiting the movements of the link arms 46 between the positions correspondingly to the said narrow and broad positions of the floor beams, respectively.

As mentioned, in an associated control unit may be arranged a protection circuit which will switch off the current to the motor 34 in response to the floor beams 6 meeting a substantial resistance towards further pivoting, inwardly or outwardly. Such a situation may be delected in different possible manners, but most conveniently by a detection of an excess motor current. Preferably the said control unit is designed such that the motor cannot be restarted in the same direction until it has been restarted in the opposite direction, whereby both the motor and the moving mechanism will be safeguarded against overload, just as the operator's attention will be automatically drawn to the jamming situation. Optionally the control unit may be adapted to automatically restart the motor invertedly so as to cause the floor beams to be moved slightly backwardly from the jamming position, in which the movement was interrupted.

It will be within the scope of the invention to make use of pedal controlled actuator means for the motor 34, but it will be a natural demand that the operator should be able to actuate the motor during the movement of the crane as a whole, such as achievable with the use of the hand carried control box.

The narrowing and broadening of the crane support chassis should not necessarily be effected by a pivoting of floor beams 6 about fixed hinges 7. It will be readily understood that it would be advantageous, though structurally more complicated, if the beams or corresponding wheel carriers were arranged so as to spread and narrow not only the front wheels, but also the rear wheels, e.g. by causing the parallel "narrow" beams to be displaced laterally in a maintained parallel position rather than by a pivoting movement.

Such a system is illustrated in Fig. 3. The floor beams 6 are provided with rear, inwardly projecting arms 54, which are telescopically received in a transverse guiding tube 56 substituting the vase member 8 of Fig. 1. The rear ends of the beams 6 are provided with a rearwardly and inwardly projecting angular arm portion 58, the inner ends of which carry a rigid nut 60 engaging with a transverse screw spindle 62, which is driven by a gear motor 64. It will be readily understood that the beams may hereby be shifted between the narrow and the broad position while still being mutually parallel.

Claims

1. A mobile crane for lifting immobile patients and moving them in a longitudinal direction of the crane, comprising a wheel supported driving chassis having a base portion oriented generally crosswise of said longitudinal direction and carrying an upstanding crane post associated with patient raising and lowering means, said driving chassis being arranged and connected with control means such that the general width thereof is changeable between respective transversely narrow and broad positions, characterized in that the said control means comprise a motor driven, self-locking mechanism, which is controllable from an easily operable actuator unit in the immediate proximity of the suspension area of the crane, e.g. a hand carried press button actuator unit as additionally provided with actuator means for the operation of the raising and lowering means.

2. A crane according to claim 1, in which the control means comprise an electrically driven spindle or gear motor, which is located behind the lower portion of the crane post and cooperates with opposed, forwardly projecting floor support beams.

3. A crane according to claim 1 and comprising a control unit designed to detect a jamming condition by the broadening or narrowing movement of the driving chassis and to hereby stop the motor and prevent a restarting thereof in the same direction until it has been restarted in the opposite direction.

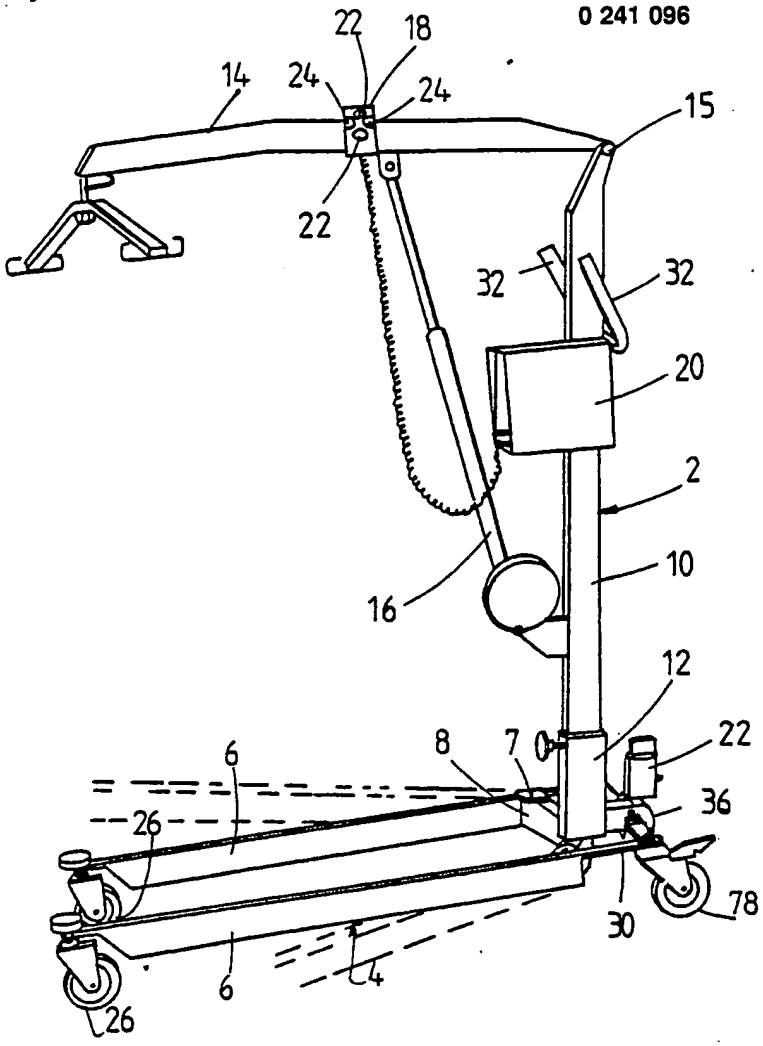

FIG. 1

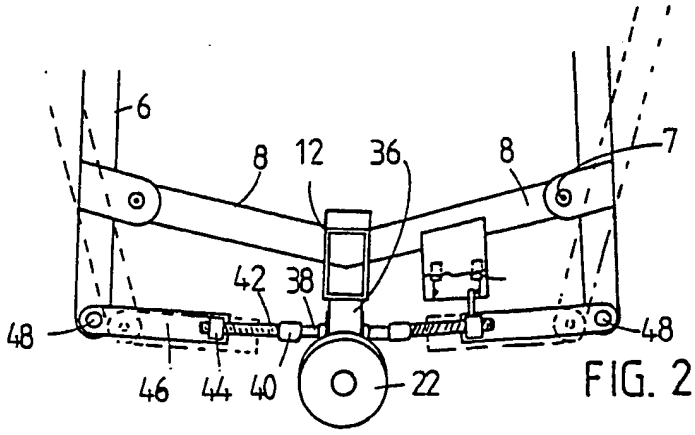

FIG. 2

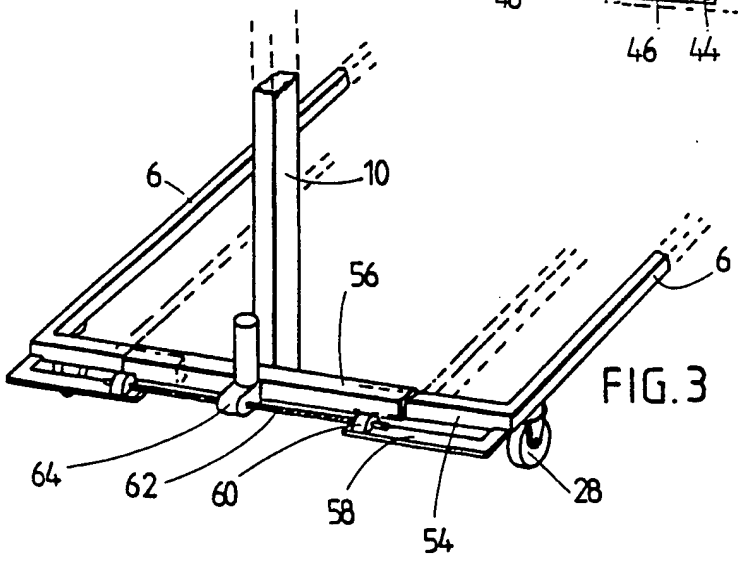

FIG. 3